

Dr. Russ Davis
Co-chair, CLIVAR SSC
US CLIVAR Project Office
400 Virginia Avenue SW, Suite 750
Washington, DC 20024

6 July 2001

Dear Russ:

Thank you for the invitation to include the US Carbon Cycle Science Program (CCSP) in an effort to produce an efficient national and international program of repeated hydrographic measurements. After discussing your invitation with members of the SSG, as well as representatives of the participating federal agencies, it is clear that there is a general appreciation of the need for the repeated measurements and of the value of thoughtful coordination.

As you state in your letter of May 21, the goals of the climate and carbon communities overlap broadly in the area of repeated ocean surveys. It is very important to design future measurements programs to address the key questions from both communities, while also taking advantage of the efficiency gains from multi-goal endeavors. It is, therefore, a pleasure to offer enthusiastic support for your effort from the Science Steering Group for the US CCSP. The US CCSP does not, however, have a dedicated budget. While our enthusiasm cannot bring with it a direct commitment of funding, we can strongly urge the Interagency Working Group to provide support.

In addition, we would be happy to help coordinate input and participation from the carbon-cycle community. Rik Wanninkhof is one of several members of the carbon SSG keenly interested in this activity and can serve as the initial point of contact for the US CCSP. It looks like the next step should be for Rik to work with Rana Fine or another member of the CLIVAR SSC to develop a plan for this activity. Rik can work with the SSG to identify other members of the carbon-cycle community who should participate on a steering committee or in a workshop. I will be happy to take the lead in keeping the activity on the agendas of the agencies that participate in the US CCSP.

An integrated program of repeat hydrography, as partially implemented during the WOCE/WHP survey, effectively leverages limited infrastructure resources and provides a value-added product for efforts in both climate and carbon science. A significant fraction of the anthropogenic CO₂ sequestration by the ocean is controlled by large scale

overturning. This can be effectively monitored through basic hydrographic and tracer measurements.

Within the community interested in carbon cycle research, there has already been considerable discussion and planning for sustained observations. Several good background documents, listed at the end of this letter, lay the framework for such observations. The documents describe two overarching and to some extent overlapping objectives. The first is a systematic observation of the penetration of the anthropogenic CO₂ signal through measurement of the relevant carbon parameters, carbon isotopes, and the parameters necessary to separate the anthropogenic carbon signal from a large natural "carbon background", such as basic hydrographic parameters, nutrients, and transient tracers. The second objective is to gain a better understanding of the yearly to decadal variability in CO₂ uptake and the causes thereof. The implementation of the first objective is reasonably well laid out and can be accomplished through repeat occupation of select lines of the WOCE/WHP survey which are also designated as CLIVAR lines. The general concept of a reoccupation of select lines on decadal intervals is outlined in the white paper of Taft et al. The execution of the second objective is less well defined but would include sustained monitoring of chokepoints, time series stations comprised of a mix of ship' occupations and mooring based observations, and surveys in deep and intermediate water formation regions.

One of the legacies of the global ocean hydrographic and CO₂ survey has been a highly trained and capable group of scientists to execute these field efforts, and to quality control and disseminate the data in a timely fashion. Also, there is an eager research community to interpret these findings, and include them in data assimilation products and modeling. One of the challenges to the community interested in this research should be crystallizing a strategy to effectively utilize these resources and engage the support of agencies willing to make a long-term commitment for sustained funding for this work. A substantial amount of this sort of work has already been done in the carbon community. It is critical that the repeat surveys should not be conducted on an ad hoc year-to-year basis.

Sincerely,

Christopher Field
Chair, SSC US CCSP

Cc: Rik Wanninkhof, NOAA AOML
Lisa Dilling, NOAA
Diane Wickland, NASA
Don Rice, NSF
Mike Johnson, NOAA
Eric Itsweire, NSF

Rana Fine, RSMAS
Paul Robbins, SIO
Jorge Sarmiento, Princeton
Peter Schlosser, LDEO
Ken Caldiera, LLNL
Hugh Ducklow, William and Mary

Pertinent background documents:

Fine, R., L. Merlivat, W. Roether, P. Schlosser, W. Smethie, and R. Wanninkhof,
Observing tracers and the carbon cycle, *Proceedings Ocean Observation 1999
Conference, St. Raphael France, submitted, 2000.*

Doney, S., C. Hood, M.A Global Ocean Carbon Observation System—A Background
Report .*A Contribution to the Integrated Global Observing Strategy (IGOS) draft.*
Written/Compiled by Scott Doney (NCAR) and Maria Hood (UNESCO-IOC) with
contributions from A. Alexiou, J. Bishop, H. Ducklow, R. Fine, N. Gruber, R. Jahnke,
K. Johnson, E. Lindstrom, K.-K. Liu, F. Mackenzie, C. McClain, P. Murphy, T. Platt,
S. Smith, V. Stuart, C. Summerhayes, B. Tilbrook, D. Wallace, and R. Wanninkhof

Taft, B., J. Bullister, R. Feely, J. Johnson, and R. Wanninkhof, NOAA Carbon dioxide
tracer program: an integrated approach to decadal ocean climate change, *NOAA* 1995.
<http://www.pmel.noaa.gov/co2/pubs/96/taft.html>